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FEMININE HYGIENE ARTICLE EQUIPPED WITH MENSTRUAL FLOW COLLECTORS

List of documents cited in the preliminary search report:	See end of this section

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The object of this invention is an article of feminine hygiene such as a sanitary napkin, of the type comprising a fluid-absorbing pad, a surface layer located on said absorbent pad, and an impermeable layer located under said pad and intended to be in contact with the underwear.

According to the invention, said article includes at least one fluid collector of which the upper end is at a distance from said surface layer and is intended to be in contact with the body, and of which the lower end is located at the level of the lower face of said pad, preferably under said lower face, and in that said collector is made of a bundle comprising at least one multistrand fibrous element, the part of said collector located above said surface layer having a convergent flared shape.

This invention concerns generally an article of feminine hygiene such as a sanitary napkin or a panty liner. The original feature of this article of hygiene is that it comprises at least one menstrual flow collector, partly arranged on the surface of the article and intended to provide continuous contact between the body and the absorbent part of the hygiene article.

In the field of feminine hygiene, the latent defect of the forms of standard external protection is that they permit leaks, particularly lateral leaks which damage and stain the underwear. In fact, the standard sanitary protection attached by adhesive to an undergarment is not in continuous contact with the user's body, particularly when the user moves or changes position.

When the user is lying down, leaks occur at the front or back of the napkin because of the poor placement of the napkin, which shifts in relation to the woman's body or because of the shape of the napkin, which is preferably designed for essentially horizontal use.

Surveys have reported that fifteen to fifty percent of women who wear sanitary napkins complain of leaks. Absorption and the absence of leakage are the principal criteria by which women choose their napkins.

In attempt to overcome these problems of leakproofing, particularly lateral leakproofing, improvements have been made in the traditional type of sanitary pads, the type that comprises a fluid-absorbing pad, a permeable top layer located on the absorbent pad and possibly enveloping this pad, and a lower impermeable layer located under the absorbent pad.

European Patent No. 91412 describes a napkin comprising elastic means attached to the side borders of the napkin to raise these edges along the pad to contract at least the central part of the border and to keep these borders in their raised positions in order to form lateral barriers against lateral leaks.

The object of European Patent No. 134086 is a sanitary napkin equipped with side flaps which, when they are folded under the undergarment, form watertight joints or barriers at the axes of flexibility.

European Patent Application No. 520884 discloses an article in which lateral rolls are formed on at least one part of the crotch area. In a preferred embodiment, the waterproof sheet forming the lower face of the absorbent pad is folded longitudinally and forms an impermeable lining of the roll, thereby improving lateral watertightness.

In addition, the desire for comfort and maintenance has led to the choice of so-called anatomical shapes, which are "hourglass" shaped or narrower in the crotch area, which conform more closely to the female body and permit better positioning of the napkin.

However, these solutions for eliminating lateral leakage are only partial.

Other studies have focused on articles of feminine hygiene consisting of external protection equipped with a protruding central absorbent zone that is placed between the lips of

the vulva. Although this type of article is external, it presents a semi-internal zone, thereby providing continuous contact between the user's body and the external part of the protection. Examples of products are illustrated by numerous patents, including U.S. Patent No. 4046147, European Patent No. 0162451, and French Patent No. 2653328. However, this type of article is not only uncomfortable, but it sometimes results in excessive fluid retention in the projection, or the semi-internal zone of the article.

We find the same problems encountered with internal forms of protection such as tampons: excessive absorption and saturation of the absorbent tampon, which results in reversible leaks.

Finally, another line of study has been developed to provide hygiene articles with a fiber-based transfer layer designed to improve fluid drainage.

U. S. Patent No. 3665922 discloses a sanitary napkin that, by its structure, immediately receives the discharged fluids, transports them rapidly by removing them from their point of discharge, and holds them effectively in the internal absorbent part, while leaving the top external face of the napkin relatively dry. Because of this, lateral leaks are decreased.

More specifically, this patent describes a sanitary napkin of which the external cover forming an envelope comprises a number of individually looped hydrophobic fibers that constitute a "high loft" nonwoven layer. Each loop is made of a single-strand fiber. The ends of each loop are attached in the base of the nonwoven fiber by means of an adhesive layer.

Although this surface layer of fibers improves the transport and the dry appearance of the surface of the article on the body side, the fibers with a very low denier – about 1.5 to 3.0, and of limited height – do not have sufficient resilience to remain in constant contact with the user's body. These fibers can even hinder the capture of fluids next to the body. In addition, this layer of fibers provides only localized transport, as the fibers do not pass through the entire internal structure of the napkin and do not penetrate the pad.

U.S. Patent No. 3967623 describes generally a layer of fibers, more specifically strands, located on the outer face of the sanitary napkin above a perforated net. This layer can be obtained by hot fibrillation of a sheet of thermoplastic polymers.

In a specific embodiment, this material forming a layer of strands is present not only on the surface of the article as a cover layer but also as an inner layer between the perforated net and the absorbent pad, the strands being turned toward the pad. The individual fibers of this inner layer mingle with the individual fibers of the pad and create channels in the pad where fluids circulate.

Thus, the inner layer, of which the fibers have been treated by a surfactant and thereby become hydrophilic on the surface, functions to transport fluids to the pad.

In this case, as well, the layers of fibers or strands transport fluids only locally. The fibers are not mutually organized and do not pass through the hygiene article from its upper face on the body side to its lower face on the underwear side. In addition, in the case of a large discharge of fluids, the surface layer of fibers or strands is so dense that the fluids will have a tendency to flow on the surface of the strands without being able to penetrate this layer, which may result in lateral leaks.

International Patent Application No. WO 93/01780 describes generally a sanitary napkin comprising a liquid-permeable surface net, a liquid-impermeable bottom layer, an absorbent pad positioned between the net and the bottom layer, and a transport layer comprising elements oriented in a "Z" direction perpendicular to the plane formed by the napkin. The lower part of this transport layer can be inserted into the pad and the upper part of this layer may extend above the pad's surface.

The elements forming this transport layer are fibers forming capillaries. More specifically, they have a shape and, more specifically, a section such that channels are created on their outer surface with this very fiber. These fibers have, for example, a U- or H-shaped section, the channels being formed, for example, by the space between the arms of the H. The capillarity within the transport layer is provided by each fiber. There is no precise arrangement of the fibers in relation to each other except for assembly into tufts, which is still a random assembly without specific positioning of the fibers in relation to each other. The fibers forming capillaries have a denier ranging from 10 to 35. They are single strands.

In general, the transport layer comprising these fibers is arranged under the permeable surface net. In two specific embodiments, some elements of the transport layer project beyond the surface of the net. In a first case, some fibers pass through the perforations of the net and their ends appear on the surface. But because of the small size of the fibers, the height of the fibers above the net is very limited, and the fibers cannot be in continuous contact with the body.

In a second case, a window is cut in the net so that part of the fibers are uncovered on the surface of the sanitary pad. However, it is likely that, in this case, these fibers do not have sufficient height or resilience to be in continuous contact with the source of fluid flow next to the body.

In addition, in all the embodiments described in this application, the capillarity gradient is provided for this device forming a sanitary napkin by a group of several different materials, from the surface to the bottom of the hygiene article:

-the perforations of the net, having a certain diameter

-the intrafiber capillary channels of the single-strand fibers constituting the transport layer, having a smaller diameter

-the interfiber channels of the fibers of the absorbent pad, with an even smaller diameter.

This device makes it possible to drain the fluids deposited on the surface of the net by leaving this net dry and transporting the fluids toward the pad in unsaturated absorbent zones However, it cannot effectively both capture fluids at their point of flow directly in contact with the body and rapidly drain them by the same material providing the capillarity from this point of flow to the bottom of the pad.

The fibers are not mutually organized to create a collector that will itself transport fluids through the entire internal structure of the napkin to the bottom of the pad.

For this reason, additional manufacturing steps are needed to reinforce the contact of the transport layer, and therefore the fibers, with the perforated net on the one hand and the absorbent pad on the other.

In addition, the transport layer forms an integral part of the internal structure of the hygiene article. In an embodiment comprising the tufts placed under the net, these tufts are formed by taking some of the stuffing from the transport layer inside the absorbent pad through a slit on the surface of the pad. In another embodiment, each fiber forming a capillary is sewn into the pad to form a small loop, and the net is then placed on the preassembly by any mechanical means such as deposit of adhesive and, if necessary, is cut. Inside a loop the capillary action is provided only by the fiber itself.

These hygiene articles equipped with a fibrous transport layer offer distinct progress in improving the drainage of menstrual fluids, but do not provide a sure means of capturing the fluids at their source.

Based on the observation of the phenomenon of lateral leaks, the essential causes of leaks in general have been established:

-absence of continuous contact between the body and the absorbent external protection, particularly when the user is lying down,

-the diversity of crotch shapes;

-the presence of pubic hairs that can drain menstrual fluids toward the side edges of the protection or even outside of the protection,

-lack of absorption due to the nature and abundance of the discharge, and

-deformation of the external protection during wearing, as it becomes damp and is subjected to stress.

The inventors have had the idea of equipping the standard external protection with one or more collectors which, like pubic hair, capture the fluids at the point of flow, but then conversely drain them in a directed manner to the bottom of the protective pad. These collectors provide transfer between the body and the absorbent protection, and optimize the penetration rate of the fluids into the absorbent protection.

The object of the invention is to remedy all the disadvantages mentioned above by reducing the leakage essentially to 0%.

To do this, the invention aims to provide continuous contact between the body and the standard type of absorbent protection regardless of the user's position and movements.

The goal of the invention is not only to capture but also to drain large fluid flows, the collectors having a "temporary" reservoir function.

The invention also has the goal of offering a hygiene article equipped with collectors of which the part located on the surface of the hygiene article is resilient, resistant to crushing, and adaptable to different crotch shapes.

Another object of the invention is to provide an article of hygiene equipped with collectors of which the apparent diameter (the diameter of the collector side located on the surface of the hygiene article) is about the diameter of a pubic hair.

Another goal of the invention is to substantially reduce the size of the sanitary napkins to make them very discreet, by offering a napkin with a large absorption capacity and the size of a panty liner.

The invention also has the goal of providing an article of feminine hygiene with a very simple and industrially feasible structure.

The invention also has the goal of eliminating, if necessary, the presence of a perforated net on the surface of the hygiene article.

The invention also has the goal of offering a simple manufacturing process for a napkin equipped with collectors from a preassembled feminine hygiene article.

The feminine hygiene article according to the invention is of the type comprising a fluid-absorbing pad, a surface layer located on said absorbent pad, and an impermeable layer located under said pad and intended to be in contact with the underwear.

According to one essential characteristic of the invention, the article of hygiene comprises at least one fluid collector of which the upper end is at a distance from said surface layer and is intended to be in contact with the body, and of which the lower end is located at the lower face of said pad, preferably under said lower face, and in that said collector is formed from a bundle comprising at least one multistrand fibrous element, the part of said collector or bundle located above said surface layer having a convergent flared shape.

According to an advantageous characteristic of the invention, said collector is equipped with flexible and permanent capillary channels formed by the spaces between the strands of said bundle forming the collector.

According to another advantageous characteristic of the invention, said bundle is a small open or closed loop comprising at least one multistrand thread.

Here and in the text that follows, the term "open loop" refers to a small loop of which the end has been shaved or cut off, which results in a velvet-type bundle or "tuft."

The object of the invention is also a process for manufacturing such a hygiene article.

According to one of the essential characteristics of the process according to the invention, it consists of:

a) forming a preassembly of the type comprising a fluid-absorbing pad and a surface layer arranged on said pad;

b) placing an external fibrous layer under or on said preassembly;

c) forming from said fibrous layer at least one bundle comprising at least one multistrand fibrous element of which the lower end is attached at the lower face of the pad, whose external part located above said surface layer is free and has a convergent flared shape toward said surface layer, and of which the upper end will come in contact with the body; and

d) attaching an impermeable layer under the hygiene article obtained in c).

Other characteristics and advantages of the invention will appear more clearly with a reading of the detailed description of the invention to follow, with reference to the illustrations in which:

-Figure 1 represents a top view of the hygiene article according to the invention according to an embodiment;

-Figure 2 represents a transversale section of the article represented in Figure 1 along axis II-II;

-Figure 3 represents the detail of a collector represented in Figure 2;

-Figure 4a is a photograph of a collector in the form of a loop, more specifically the part of the collector or loop located just above the surface layer;

-Figure 4b is a photograph of the collector of Figure 4a, and it illustrates the drainage of the fluids within this collector;

-Figure 5 represents a cross section of another embodiment according to the invention where the loops forming the collectors are open;

-Figures 6a to 6e are photographs of an open loop forming a collector, illustrating the capture and drainage of a drop of fluid in the absorbent hygiene article;

-Figure 7 represents the surface of a hygiene article covered with loops, the height of which is adapted to the shape of the crotch;

-Figures 8a, 8b, and 8c represent the section of the article represented in Figure 7 along axes VIIIa-VIIIa, VIIIb-VIIIb, and VIIIc-VIIIc, respectively;

-Figures 9a, 9b, and 9c illustrate the different stages of a shaving process in one form;

-Figure 10 represents a longitudinal section of the article represented in Figure 1 along axis IX-IX, and

-Figure 11 represents the liquid acquisition time curve of the hygiene article according to the invention depending on the number of collectors provided on this article.

With reference to Figures 1-3, the hygiene article according to the invention is a standard type of external hygienic protection 1 that advantageously comprises at least one means forming a collector 2 providing, on the one hand, for capture of fluids at the point of flow near the body, or at a location in contact with the body as near as possible to the source of the menstrual flow, and, on the other hand, drainage of fluids from this point of contact with the body to the internal absorbent structure of the protection.

In general, the external protection 1 comprises an absorbent pad 3, a surface layer 4 located on the absorbent pad 3 and an impermeable layer 5 located under the absorbent pad and intended to be in contact with the underwear by a standard means of attachment, such as an adhesive.

Preferably, before use, this protection is equipped with a means of protection 6 of the means of attachment. In the case of attachment by adhesive, this means may be a silicone-coated band.

The means forming a collector 2 is made up of a bundle containing at least one multistrand fibrous element, of which the external part 7 is located above the surface layer 4, and of which the internal part 8 is located under this surface layer, and passes through the absorbent pad. The external part 7 is free and has a convergent flared shape toward the surface layer 4. This external part can be shaped like a truncated cone, or more concretely, a "funnel" shape. More specifically, the multistrand fibrous elements are assembled inside the bundle to create a "receptacle" with a flared shape whose base is narrowed at the surface of the hygiene article, or on the surface layer. The upper free end 9 of the collector 2 is intended to come in contact with the body and to catch fluids.

The external part is flexible and resilient, and has a height (d) of about 3 to 20 mm, preferably about 5 to 10 mm, so that the upper end 9 of the collector will be continuously in contact with the body, regardless of the user's position and the movements and displacements of the body in relation to the external protection attached to the underwear.

In the internal part 8 of the bundle forming the collector, the fibrous elements are closer together and are organized into a spindle shape with narrow zones corresponding to the passage of each layer of material such as the surface layer or the layers forming the envelope of the pad, represented on Figure 2 by the upper envelope 10 and the lower envelope 11 of the pad 3.

The unique aspect of the collector is that it creates a capillary network within the bundle. In fact, the organization of the strands inside this bundle forms capillary channels 12 between the strands; these channels are permanent and flexible.

The capillarity gradient is provided by the collector itself. In fact, the diameter of the channels decreases from the upper end of the collector toward the base of the outside and convergent part of the collector located in the surface layer, where the strands are closer together as they pass through this layer. The diameter of the interstrand channels or spaces continues to decrease as they pass through each layer of material to the bottom of the pad, particularly the lower envelope 11 of the pad, where the channels have a smaller diameter.

Therefore, this invention provides for the capillarity within a same material made up of multistrand fibrous elements and in a same unit or bundle of organized fibrous elements forming a collector, through the entire structure of a hygiene article.

These collectors have the advantage by their nature of being able to catch and hold temporarily a large quantity of fluids when exposed to heavy menstrual flow, and thereby form a temporary reservoir that simultaneously and directly drains the fluids into the absorbent part of the napkin. This twofold capacity as reservoir and drainage is illustrated by Figures 4a and 4b, where Figure 4b is a photograph of the external part of a collector as it is working, showing the capture and guidance of fluids in the capillary network formed by the strands of the bundle.

These collectors also have an advantage, with respect to their external part, of being resilient and resistant to crushing. They return to their shape and position after deformation, for example, when the user moves or changes position. The choice of appropriate fibrous material having these characteristics will be discussed in the description to follow.

The bundles may be present in the form of open or closed loops. The loops are open when they are cut or shaved off on the end. This embodiment is represented in Figure 5 by the external part 7' of the collectors 2'.

Figures 6a to 6e are photographs of a collector in the form of a loop with the top shaved off. These figures illustrate the capture of a drop of fluid at the top of the loop (Figure 6a) and drainage of the fluids from this upper end of the collector to the base of its external part (Figures 6d and 6e).

It can be seen that the bundle formed from multistrand fibrous elements empties as the fluid descends by capillary action into the absorbent part of the napkin. It should be noted that the surface layer remains dry, as the fluid scarcely comes in contact with the materials forming the surface layer. The convergent flared shape combined with the interstrand spaces forming the capillary network advantageously favor rapid fluid drainage. This series of photographs also illustrates the good cohesion of the strands within the bundle.

The distribution of the collectors on the surface of the article is another parameter that improves the product.

The collectors such as loops may be located at the center of the article so that they are concentrated in a zone where they will be in contact with the part of the body that is the source of fluid flow.

These collectors may be arranged lengthwise to the article, in several rows, and may be more or less narrowed transversally. These rows may be relatively wide. The collectors may be arranged in an oval or other pattern on the surface of the hygiene article. The collectors may be arranged, for example, in the central part of the article in concentric circles with the tallest collectors located in the center. In one particular embodiment, the surface of the hygiene article or the surface layer may be total covered with collectors. Advantageously, the height of the collectors varies with the shape of the crotch.

For this purpose, collectors of variable height are provided. This is illustrated by Figure 7, representing schematically the surface of a napkin where the collectors are loops. Figures 8a, 8b, and 8c show the distribution of the loop heights, respectively, for the front part, the central part, and the back part of the sanitary napkin represented in Figure 7, corresponding to the profiles of the front, central, and back parts of the pubic region.

A profile of this region can be made by molding. Thus, by counter-molding or counter-forming, a pattern can be reproduced for the distribution of the collectors of different heights on the surface of the hygiene article. In this case, the total surface of the article is covered by loops of a given maximum height, the article is applied to a mold corresponding to the crotch area, and the loops are then shaped off to reproduce the crotch shape. Figures 9a, 9b, and 9c illustrate the various stages of this shaving process in one form.

One advantageous consequence of the collectors on the hygiene article according to the invention is the substantial increase in the absorption capacity of the napkin. Because of this, it is possible to considerably reduce the size of the napkin by choosing appropriate absorbent materials. In fact, a napkin of "standard" absorption capacity may be the size of a panty liner: it may be very thin, on the one hand, and it may have a shorter length, on the other hand, so that it covers essentially only the pubic area.

In other respects, the hygiene article according to the invention may have side flaps, if necessary. But the role of these flaps as a side barrier is not essential.

Another advantage of the article according to the invention is the possibility of using any type of material for the surface layer; it may be a more or less permeable material, since fluid penetration is assured by the collectors. It would be possible to have an article with a surface layer of impermeable material. Any material could be considered if it has the property of being permeable to air or to water vapor while being impermeable to liquids. Therefore, permeability to liquids is not an absolute necessity for this surface layer. Thus, materials other than increasingly sophisticated and expensive perforated plastic nets may be used. Simple materials

that maintain the pad are sufficient. In this connection, a hygiene article in which, for example, the surface layer is merged with the envelope of the pad is part of the invention. A nonwoven, woven, or knitted textile material of light weight is also appropriate. The surface layer may be formed from a mixture of hydrophilic and hydrophobic fibers.

Preferably, this surface layer is a nonwoven material, which may or may not be carded, such as a "high loft" nonwoven fabric or a "meltblown" material, or a material formed from continuous heat-bonded filaments ("spunlaid" technology).

In general, the materials traditionally used for thin napkins can be transferred to the product according to the invention, except for the surface layer, where optimal permeability is not longer an issue.

The absorbent pad may be made of any standard absorbent material. In a preferred embodiment, this pad is formed from cellulose fibers containing a superabsorbent material in powder form. For example, a band of paper cellulose fibers made by the dry method and bound by latex, or an "airlaid" type of material, of which the two side edges are turned down over a central part on which the superabsorbent material is previously deposited, may form this type of pad. A pad of this kind is shown in Figure 2. The superabsorbent material may be in the form of powder, fibers, sheets and also powder bound to synthetic fibers. It is also possible to design a pad made up of a mixture of cellulose fibers and synthetic fibers, placed between two layers of cellulose wadding, with the whole being heat-bonded.

Other materials such as a synthetic foam, for example polyurethane, or a natural foam, such as treated peat moss, having large absorption capacities, may be used. The treatment of the peat moss mentioned above is described in European Patent Application No. 0546585.

The impermeable layer located under the absorbent pad is made of an impermeable plastic material such as polyethylene. It may also be made of a material that is permeable to both air and water vapor and impermeable to fluids. One example of such a material is a "meltblown" nonwoven fabric made of microfibers, for example polyethylene.

The surface layer and the impermeable layer are combined, for example, by sealing to envelop the pad.

The material forming the collectors is now described in more detail.

The multistrand fibrous element forming the bundle is a filament or a multistrand thread or any combination of fibers in multiple strands. The combination of at least three fibers to form a fibrous element itself in the form of a bundle is part of the invention.

Thus, a collector in the form of an open or closed loop may be made of one to several filaments or multistrand threads.

A fibrous element such as a thread is preferably curled or texturized, which improves its resilience.

Each fibrous element includes about 2 to about 200 strands; each strand has a count of at least 6 dtex.

In addition, this fibrous element has a count of at least 50 dtex and is preferably in the range of about 180 to about 5000 dtex.

Fibrous elements situated in this higher count range are appropriate for the characteristics of resilience and resistance to crushing that are desired for the external part of the collectors.

Preferably, each fibrous element includes between about 30 and about 1000 strands, the unit count of a strand being at least 17 dtex.

The choice of the unit count of a strand and the number of strands per fibrous element is crucial for obtaining the balance between resilience and softness. For example, for a strand with a low count, a large number of strands will be needed to compensate for low resilience.

The fibrous element as such is preferably hydrophilic, but not absorbent. It can be treated, for example, with a surfactant, to make it hydrophilic.

The fibrous element may be based on natural, artificial, synthetic fibers, or mixtures thereof. The criteria for choice of the type of fibrous element are resilience and softness.

Considering the high count of the fibrous elements used, these fibers must be relatively soft in contact with the skin.

Among natural fibers, cotton or linen may be used, but they should be treated to make them less hydrophilic. In the case of a fibrous element made of cotton, twist thread will be used, which is two or three threads put together by twisting.

Among artificial fibers, viscose is also appropriate if it is treated to make it less hydrophilic.

Finally, the synthetic fibers are preferred, and are chosen from polyester, polyamide, polyethylene, or polypropylene. It is preferable to choose fibrous elements of polyamide for greater softness, or of some types of polyesters that are both resilient and soft. Polypropylene will be chosen if high resilience is most desired.

Within a single bundle it is possible to combine different types of fibers depending on the desired properties: softness, hydrophilicity, and resilience. The height of the strands inside a single bundle may also vary. The nature of the fibrous elements may also change from one bundle to the next, as can the number of strands per fibrous element. In this way, it is possible to form zones of collectors some of which are softer and others more resilient. It is also possible to create, for example, variations in hydrophilicity from one collector to the next or from one part of the surface of the article with collector to another part of this surface.

Different embodiments of the article according to the invention are given below, but are not in any way limiting.

The process according to the invention consists of forming collectors from a fibrous layer located on the outside of a preassembly, by partly inserting them into this preassembly composed of different layers of materials forming the hygiene article. In this way, the collector is formed by an addition of external material to an existing preassembly.

In a first step, a preassembly is formed by preparing a hygiene product, for example, of a stratified type, by placing a surface layer on an absorbent pad. Then on or under this preassembly there is placed an external fibrous layer. From this fibrous layer there is formed at least one collector in the form of a bundle comprising at least one multistrand element. The lower end of this bundle is attached to the level of the lower face of the pad, and the external part of this bundle is free above the surface layer and has a flared shape converging toward the surface layer. Therefore, the bundle passes through the preassembly.

The impermeable layer is then attached under the preassembly equipped with collectors, for example by sealing the edges of this layer with those of the surface layer around the edges of the pad, or by any other means. Attachment means such as adhesive bands are placed under the impermeable layer. Finally, a means for protecting the means of attachment is provided, such as a silicone-coated band placed on the deposits of adhesive bands.

In the manufacturing stage of the collectors, several embodiments are possible, some of which are described below for purposes of illustration.

From an external fibrous layer provided above the preassembly and formed of a continuous multistrand thread or from several discontinuous multistrand threads, it is possible to stitch this thread by sewing through the preassembly to the bottom of the pad and to form a surface loop containing at least one multistrand thread.

The multistrand thread passes through each layer of material forming the preassembly in one and the same point. A same continuous thread may serve to form all the loops. Figure 10 shows that the loops of a same row, obtained by sewing from a same continuous thread, are connected to each other at the lower face of the pad, specifically under it.

Consequently, the thread runs under the pad and diffuses the liquids from one end to the other of this pad.

The loops may be directly sewn in several rows.

These loops formed by sewing can be made on a sewing machine such as a Malipol, which forms chain stitches through the preassembly. One the loops are formed, they are left intact or they are cut or shaved off. The loops can be shaved in a shape consistent with the crotch shape, as described above.

The fibrous layer corresponding to one or more threads is removed once the collectors are formed.

In another embodiment, the external fibrous layer is located under the preassembly and is also made up of at least one continuous or discontinuous multistrand thread.

The collectors are made by a known technique called tufting, which consists of using a needle to stitch the thread through the preassembly to form a loop by extending the needle to a height (d) above the surface layer and withdrawing this needle. The loop may be cut off. A single-needle machine with unilateral action can be used to obtain a small number of loops.

In this type of machine, the needle is forked. When the needle is stitched through the preassembly, the thread is taken by the fork after the needle is withdrawn and exceeds the height (d) of the surface layer. In this case, the reverse side of the preassembly is worked.

Appropriate multiple-needle machines to pass through the various materials of the preassembly can also be used. In this type of machine, several needles are provided, but to obtain loops with enough space between them, machines having needles at least every 2.5 mm in the crosswise direction and 2 mm in the machine direction are preferred.

The choice of the surface layer is also important in this case. It should be sufficiently resistant under the action of the needles. Nonwoven textile materials such as nonwovens made of continuous heat-bonded filaments (spunlaid technology) or meltblown nonwovens are appropriate.

It is also possible to use a plastic sheet for this surface layer.

In another embodiment, the external fibrous layer is also placed under the preassembly, more specifically under the absorbent pad. Here, this fibrous layer is a sheet of carded fibers. In this case, it is associated with the preassembly and will remain in the finished hygiene article.

In this embodiment, the collectors may be formed by a needleloom process. The fibrous layer which is a carded sheet, bonded or not, or a net, includes fibers of different lengths and different counts, curled or uncurled. Fibrous elements of the sheet are thereby introduced by means of needles through the preassembly and form bundles of multistrand fibrous elements corresponding to the collectors, part of which appear on the surface of the preassembly above the surface layer. The base of these bundles is kept, if necessary, under the fibrous sheet, for example by an adhesive layer or by heat-bonding.

The needleloom is of the standard mechanical type: it is performed by means of steel needles, and the needles have barbs.

A procedure using the needleloom process is completely feasible on an industrial scale.

An example of an article with its collectors formed by a mechanical needleloom is given below.

The preassembly is made up of a fibrous carded sheet with a weight of 50 g/m^2 based on polyethylene fibers, forming the external fibrous layer, covered by a layer of paper cellulose fibers bonded by a latex and obtained by the dry method ("airlaid"), having a weight of 65 g/m^2,

forming the pad, which is itself covered by a layer of nonwoven fabric in the form of a traditional carded net, forming the surface layer. Any other type of absorbent material may be used for the pad, such as polyurethane foam or treated peat moss foam.

The process in general, whether by sewing, tufting, or needleloom, in this case a mechanical needleloom, eliminates the stage of assembling the various materials of the preassembly forming the hygiene article. A simple superposition of the surface layer, the absorbent pad, and the external fibrous layer is sufficient. In fact, the bonding between the various layers of material is obtained directly by the stage of formation of the collectors in the form of bundles of fibrous elements passing through the various layers of materials.

The advantage of such a process is the combination of the bonding of different materials to each other and the formation of collectors by fibrous elements pulled through the various materials.

Sealing around the edges is then preferably carried out between the surface layer and the impermeable layer placed under the preassembly to consolidate the whole of the article and to form a more watertight envelope around the pad.

Tests have been conducted on articles with loop collectors obtained by sewing.

The effectiveness of the collectors, particularly drainage, was quantified by measuring the liquid acquisition speed of a loop.

Samples were prepared as follows: In a first step, the absorbent pad was made. We formed a sheet containing 80% cellulose fibers and 20% heat-fusible synthetic fibers using a pneumatic method, then transferred this sheet, previously deposited on a piece of cellulose wadding, to a heat-bonding oven. When it was removed from the oven, a second piece of cellulose wadding was placed on the upper face of the sheet. The whole was then passed through a heated calender to bond the last sheet to the other piece.

From the resulting unit we took samples of about 4 x 4 cm^2, weighing about 1 g and having a thickness of about 0.60 cm. On the surface of these samples we placed a surface layer made of a meltblown nonwoven fabric sold by the Corovin Company. This nonwoven fabric has a weight of 20 g/m^2, and it is permeable to water vapor and impermeable to liquids.

We then formed the collectors, in this case loops, manually by sewing. We used a multistrand 6.6 polyamide thread of 1260 dtex and having 68 strands, sold by Rhône-Poulenc. Using a modified sewing needle, we formed a loop of which the two ends of the multistrand thread composing the loop pass through the preassembly formed from the absorbent pad and the surface layer at a single point. Because of this, the strands are close together in the passage of the absorbent pad, thereby forming the capillarity gradient, with the capillary channels being formed on the inside of a loop by the space between the strands.

For a same sample, it is possible to arrange one or more loops in a precise pattern.

We also prepared control samples by introducing the sewing needles in the same pattern as for the sample with loops, but without using thread.

On a loop left intact and on a loop with the top cut off, we observed excellent drainage of a drop of synthetic liquid resembling the formula of human blood, the drop being deposited on the ends of both the intact and the open loop. In fact, in both cases, the liquid is brought to the base of the loop and it disappears into the absorbent pad rapidly and surprisingly.

We prepared five samples, each with 1 to 5 loops following a specific pattern of arranging the loops. For each sample, this pattern corresponds to the pattern represented by each side of a die from "1" to "5": the sample with one loop has the pattern of the "1" on the die side, the sample with two loops has the pattern of the "2" on the die, etc.

The loops are kept intact and are about 1 cm high.

Five control samples were prepared with the same arrangement but without thread.

They were then measured by the following method.

For a given sample, the loops are enclosed in a tube having an internal diameter of 20 mm, which is placed on the sample. We inject 2 mL of synthetic liquid simulating menstrual flow into the tube in 1.2 sec. A timer is set at the same time as the injection, and it is stopped when all the loops are visually "dry" or "empty." In this way, the acquisition time is measured.

We also measure the quantity of liquid remaining on the surface of the sample. Immediately after the timer stops, two sheets of Whatman No. 4 blotting paper, 9 x 14 cm and weighing 2.37 g, are placed and topped with a mass of 500 g of a diameter of 38 mm.

The quantity of liquid remaining on the surface of the sample is about 1.6% by weight of the quantity injected regardless of the number of loops on the sample.

The same measurement was made on the control samples. However, this was not possible because the liquid does not penetrate the control sample, and the acquisition time remains higher than 5 min regardless of the means of introduction used.

The results of the acquisition time measurements are shown on the curve represented in Figure 11, where the acquisition time is a function of the number of loops.

As shown on the curve, the acquisition times decrease with the number of loops implanted. Of course, there is an upper limit to the number of loops beyond which the liquid is no longer caught by the loops if they form an excessively dense cover and the liquid runs over it.

The very long acquisition time for the controls was not reported on the curve.

The acquisition time inversely proportional to the number of loops can be expressed by a law of the type:

$$T = \frac{(t\,l)}{N} k + to$$

wherein:

-t1 is the acquisition time of a loop

-N is the number of loops

-k is the coefficient that depends on the nature of the surface layer $0 \leq k \leq 1$

with k tending toward 0 for a very permeable nonwoven fabric and

k tending toward 1 for a very hydrophobic nonwoven fabric, and

-to is the flow time of the 2 mL of liquid in the tube, in this case 1.2 sec.

The hygiene articles comprising collectors according to the invention offer exceptional drainage.

This drainage function combined with the function of catching the fluids directly in contact with the body make this article an outstanding product.

The invention includes all the complementary and equivalent means that have not been described and that are accessible to a person skilled in the art.

Claims

1. Feminine hygiene article such as a sanitary napkin of the type comprising a fluid-absorbing pad, a surface layer located on said absorbent pad and an impermeable layer located under said pad and designed to be in contact with an undergarment, characterized in that said article includes at least one fluid collector, the upper end of which is at a distance (d) from said surface layer and is designed to be in contact with the body, and of which the lower end is located at the lower face of said pad, preferably under said lower face, and in that said collector is made up of a bundle comprising at least one multistrand fibrous element, the part of said collector located above said surface layer having a convergent flared shape.

2. Hygiene article according to Claim 1, characterized in that said collector is equipped with flexible and permanent channels formed by the spaces between the strands of said bundle that constitutes the collector.

3. Hygiene article according to Claim 1 or 2, characterized in that said bundle is an open or closed loop comprising at least one multistrand thread.

4. Hygiene article according to any of the preceding claims, characterized in that (d) ranges between about 3 mm and about 20 mm, preferably between about 5 and about 10 mm.

5. Hygiene article according to any of the preceding claims, characterized in that each fibrous element of said bundle forming the collector contains between about 2 and about 200 strands, preferably between about 30 and about 100 strands.

6. Hygiene article according to Claim 5, characterized in that each unit strand has a number of at least 6 dtex, preferably at least 17 dtex.

7. Hygiene article according to any of Claims 3 to 6, characterized in that said multistrand fibrous element has a number between about 180 dtex to about 5000 dtex.

8. Hygiene article according to Claims 5 and 6, characterized in that each strand has a number of at least 17 dtex and each fibrous element includes at least 30 strands.

9. Hygiene article according to any of the preceding claims, characterized in that the above-mentioned fibrous element is of natural origin such as cotton, artificial such as viscose, or synthetic such as polyamide, polyester, polypropylene, or polyethylene.

10. Hygiene article according to any of the preceding claims, characterized in that the fibers are preferably hydrophilic or are made to be hydrophilic.

11. Hygiene article according to any of Claims 3 to 10, characterized in that the total surface of the hygiene article is covered with loops, the height of the loops varying in proportion to the distance separating the body from said surface layer.

12. Process for manufacturing a hygiene article according to any of the preceding claims, characterized in that it consists of:

a) forming a preassembly of the type comprising a fluid-absorbing pad and a surface layer placed on said pad;

b) arranging an external fibrous layer under or on said preassembly;

c) forming from said fibrous layer at least one bundle containing at least one multistrand fibrous element of which the lower end is attached to the level of the pad's lower face, of which the external part located above the surface layer is free and has a flared shape converging toward said surface layer, and of which the upper end is designed to be in contact with the body; and

d) attaching an impermeable layer under the hygiene article obtained in c).

13. Process according to Claim 12, characterized in that the fibrous external layer is placed on the above-mentioned assembly and is formed from at least one continuous or discontinuous multistrand thread, and in that said multistrand thread is stitched by sewing through the above-mentioned preassembly to form at least one bundle in the form of a loop made up of multistrand thread.

14. Process according to Claim 12, characterized in that the external fibrous layer is arranged under the above-mentioned assembly and is formed from at least one continuous or discontinuous multistrand thread, and in that said multistrand thread is stitched by a known technique of tufting through the above-mentioned assembly to form at least one bundle in the form of a loop made up of multistrand threads.

15. Process according to Claim 14, characterized in that the surface layer is preferably a nonwoven textile material.

16. Process according to Claim 13, 14, or 15, characterized in that said bundle in loop form is cut.

17. Process according to Claim 12, characterized in that said external fibrous layer is made up of a sheet or net of fibers, and is placed under the above-mentioned preassembly, and in

that the fibrous elements resulting from said external layer are passed through the preassembly by a needleloom technique to form a bundle of multistrand elements, of which the part on the surface of the hygiene article had a flared convergent shape.

18. Process according to Claim 17, characterized in that the above-mentioned needleloom is a mechanical needleloom.

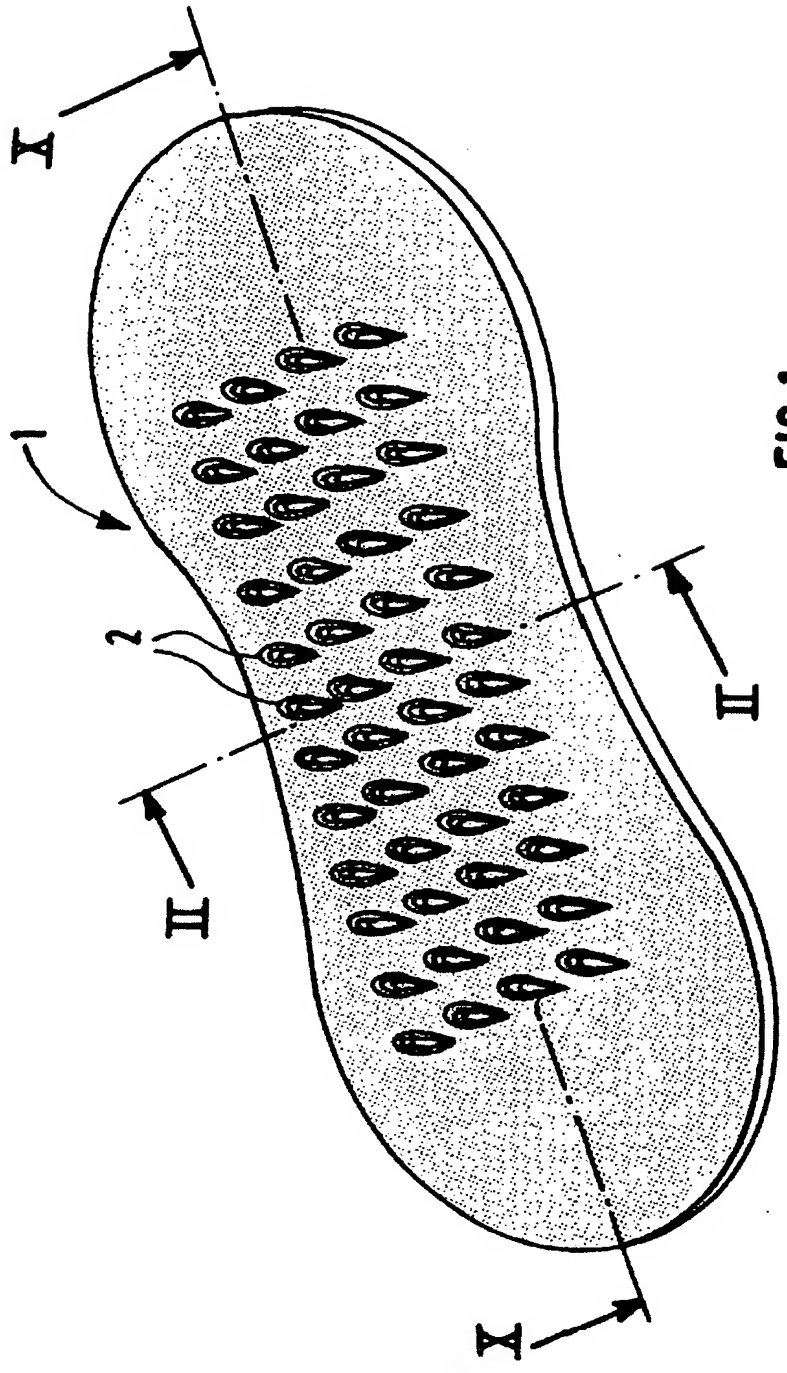

FIG.1

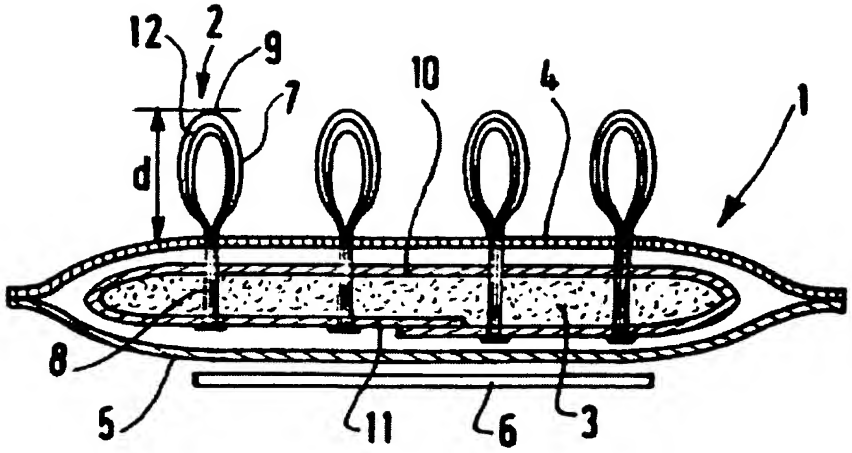

FIG.2

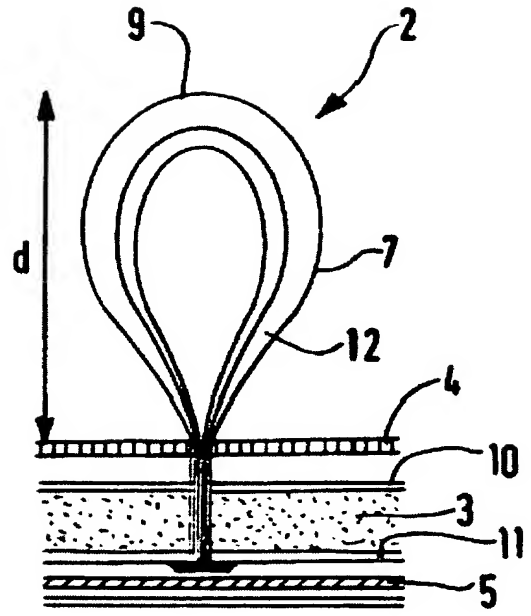

FIG.3

FIG. 4a

FIG. 4b

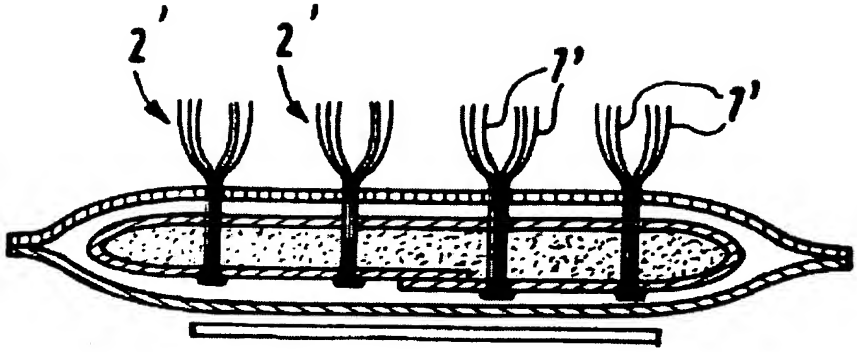

FIG. 5

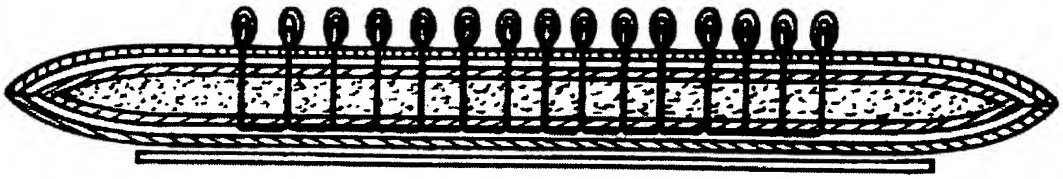

FIG. 10

FIG. 6a

FIG. 6b

FIG. 6c

FIG. 6d

FIG. 6e

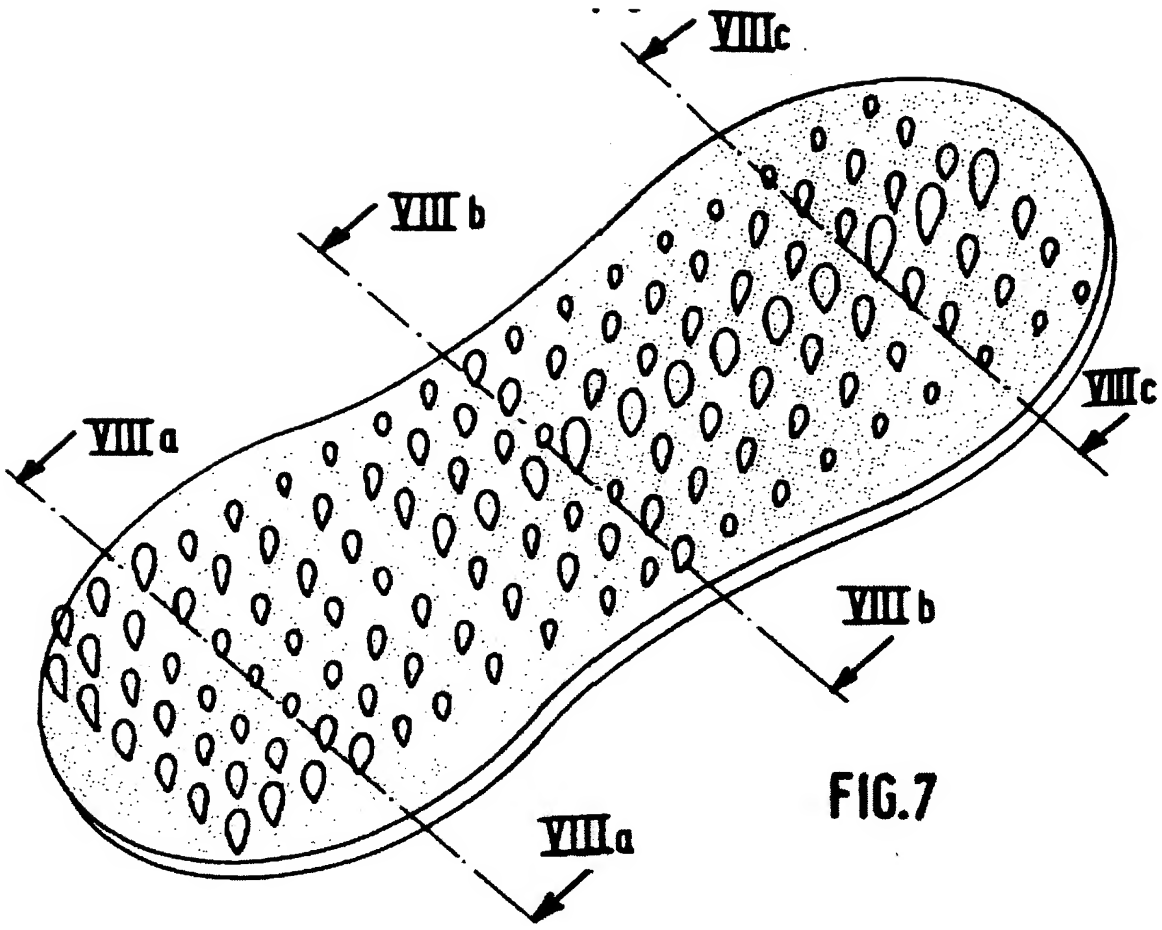

FIG.7

FIG.8a

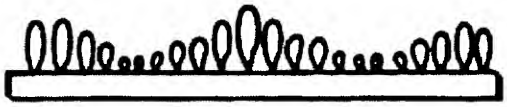

FIG.8b

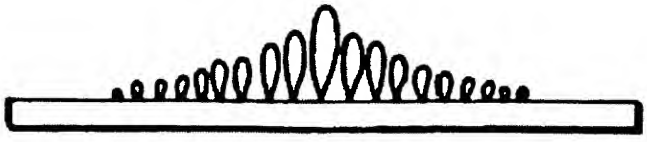

FIG.8c

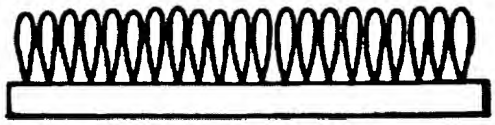

FIG.9a

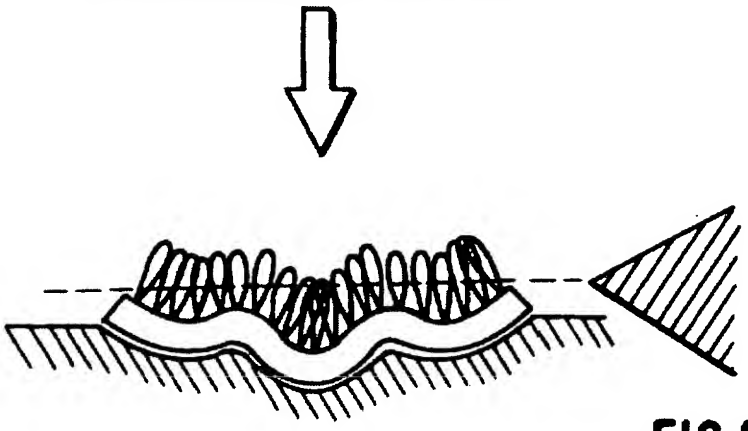

FIG.9b

FIG.9c

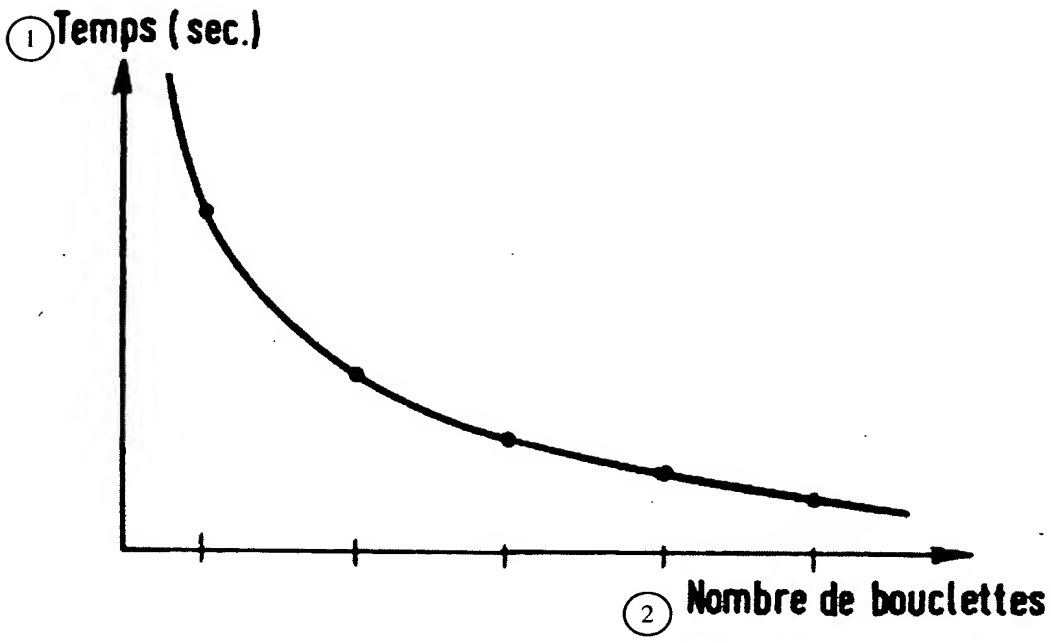

FIG.11

Key: 1 Time (sec)
2 Number of loops

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of Industrial Property

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FR 9314513

PARTIAL PRELIMINARY SEARCH REPORT

established on the basis of the most recent claims
filed before the start of the search
see Supplementary Pages

DOCUMENTS CONSIDERED TO BE RELEVANT		Claims concerned	
Category	Citation of document with indication where appropriate, of relevant passages		
X	EP-A-0 429 802 (GUILFORD MILLS INC.) * Figure 2, examples *	1-7	
X X	WO-A-91 01766 (NATIONAL FELT CO.) * page 11, last paragraph, page 12, paragraph 1, Figure 4 *	1,2	
X	EP-A-0 525 276 (MC NEIL – PPC, INC.) * entire document *	1,2	
X	US-A-3 420 234 (J. T. PHELPS) * entire document *	1,2	
X	US-A-3 905 372 (M. C. DENKINGER) * Figures 3,5,6 *	1-4	TECHNICAL FIELDS SEARCHED (Int. Cl.[5]) A61F
X	US-A-5 169 394 (LAI. D. JEAN) * entire document *	1,2	

Date of completion of the search	Examiner
August 22, 1994	Argentini, A

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